



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

# THE PHANTOMS BEHIND US

BY JOHN BURROUGHS

---

I TAKE the title of this paper from those great lines in Whitman beginning

“Rise after rise bow the phantoms behind me,”

and in which he launches in vivid imaginative form the whole doctrine of evolution some years before Darwin had published his epoch-making work on the *Origin of Species*.

“I see afar down the huge first Nothing, and I know I was even there.”

I do not know that Whitman had any concrete belief in the truth of the animal origin of man. He read as picture and parable that which the man of science reads as demonstrable fact. He saw and felt the great truth of evolution, but he saw it as written in his own heart and not in the great stone book of the earth, and he saw it written large. He felt its cosmic truth, its truth in relation to the whole scheme of things; he felt his own kinship with all that lives and had a vivid personal sense of his debt to the past not only of human history, but also to the past of the earth and the spheres. And he felt this as a poet and not as a man of science.

The theory of evolution as applied to the whole universe, and its inevitable corollary, the animal origin of man, is now well established in most of the leading minds of the world, but it is still a hard proposition to many timid and sensitive souls and it will be a long time before it becomes universally accepted.

Doubtless one source of the trouble we have in accepting the theory comes from the fact that our minds have not been used to such thoughts; in the mind of the race they are a new thing; they are not in the literature nor in the philosophy nor in the sacred books in which our minds have

been nurtured; they are of yesterday; they came to us raw and unhallowed by the usage of ages; more than that, they savor of the materialism of all modern science which is so distasteful to our finer ideals and religious sensibilities. In fact, these ideas are strangers of an alien race in our intellectual household, and we look upon them coldly and distrustfully. But probably to our children, or to our children's children, they will wear quite a different countenance; they will have become an accepted part of the great family of ideas of the race.

Another hindrance is the dulness and opacity of our own minds. We are slow to wake up to a sense of the divinity that hedges us about. The great office of science has been to show us this universe as much more wonderful and divine than we have been wont to believe; shot through and through with celestial laws and forces; matter, indeed; but matter informed with spirit and intelligence; the creative energy inherent and active in the ground underfoot, not less than in the stars and nebulae overhead.

We look for the divine afar off. We gaze upon the beauty and purity of the stars without thinking that we are gazing at them from a sister star. We must open our minds to the stupendous fact that God is imminent in His universe and that it is literally and exactly true as we were taught long ago that during every moment of our lives in Him we live and move and have our being.

Moreover, we are staggered by the element of vast time that is implied in the history of development. Were it not for the records in the rocks we could not believe it at all. All the grand movements and processes of nature are quite beyond our ken. In the heavens only the astronomer with his prisms and telescopes traces them; only the geologist and paleontologist read their history in the earth's crust. The soil we cultivate was once solid rock, but not in one lifetime, not in many lifetimes do we see the transformation of the rocks into soil. Nations may rise and fall, and the rocks they looked upon and the soil they tilled remain practically unchanged. Geologists talk about the ancient continents that have passed away. What an abyss of time such things open! They talk about the birth of a mountain or of the decay of a mountain as we talk of the birth and death of a man, but in doing so they reckon with periods of time for which we have no standards of measurement. They

walk and talk with the Eternal. To us the mountains seem as fixed as the stars. But the stars, too, are flitting. Look at Orion some millions of years hence and he will have been torn limb from limb. The combination of stars that form that striking constellation and all other constellations is temporary as the grouping of the clouds. The rise of man from the lower orders implies a scale of time almost as great. It is unintelligible to us because it belongs to a category of facts that transcends our experience and the experience of the race as the interstellar spaces transcend our earthly measurements.

We now gaze upon the orders below us across an impassable gulf, but that gulf we have crossed and without any supernatural means of transportation. We may say it has been bridged or filled with the humble ancestral forms that carried forward the precious evolutionary impulse of the vertebrate series till it culminated in man. All vestiges of that living bridge are now gone, and the legend of our crossing seems like a dream or a miracle. Biological evolution has gone hand in hand with geological evolution and both are on a scale of time of which our hour-glass of the centuries gives us but a faint hint. Our notions of time are not formed on the pattern of the cosmic processes, or the geologic processes, or the evolutionary processes; they are formed on the pattern of our own brief span of life. In a few cases in the familiar life about us we see the evolutionary process abridged, and transformations like those of unrecorded time take place before our eyes, as when the tadpole becomes the frog or the grub becomes the butterfly. These rapid changes are analogous to those which in the depths of geologic time have evolved the bird from the fish or the reptile, or the seal and the manatee from a four-footed land animal. Our common bluebird is evidently a remote descendant of some form of the thrush family; we may infer this fact from the speckled breast of the young birds and from the voices of the mature birds. I have heard a bluebird with an unmistakable thrush note. The transformation has doubtless been so slow that an analogous change taking place in any of the bird forms of our own time would entirely escape observation. The bluebird may have been as long in getting his blue coat as man has been in getting his upright position.

Then looking into the laws and processes of the common

nature about us for clues to the origin of man is not unlike looking into the records of the phonograph for the secret of the music which that wonderful instrument voices for us. Something, some active principle or agent, has to invoke the music that slumbers or is latent in these lines.

In like manner some principle or force that we do not see is active in the ground underfoot and in the forms of life about us which is the final secret of the origin of man and of all other creatures. This something is the evolutionary impulse, this innate aspiration of living matter to reach higher and higher forms. "Urge and urge," says Whitman, "always the procreant urge of the world." It is in Emerson's worm "striving to be man." This "striving" pervades organic nature. Whence its origin science does not assume to say.\*

Then the difference in kind between the mind of man and that of the lower orders makes evolution a doubly hard problem.

Look over the globe and see what a gulf separates man from all other creatures. All the other animals seem akin—as if the product of the same workman. Man, in contrast, seems like an introduction from some other sphere or the outcome of quite other psychological laws; his dominion over them all is so complete and universal. Without their specialization of structure or powers, he yet masters them all and uses them; without their powers of speed, he yet outstrips them; without their strength of tusk and limb, he yet subdues them; without their inerrant instinct, he yet outwits them; without their keenness of eye, ear, and nose, he yet wins in the chase; without their special adaptation to environment, he survives where they perish. A man is marked off from the animals below him, I say, as if he were a being of another sphere. He looks into their eyes and they into his and no recognition passes; and yet we have to believe that he and they are fruit of the same biologic tree and that their stem forms unite in the same trunk somewhere in the abyss of biologic time.

The rise of man from the lower orders taxes our powers of belief and our faith in the divinity that lurks underfoot far more than did the special creation myth. Creation by omnipotent fiat seems easy when you have the omnipotent being to begin with, but creation through evolution is a

\* This passage was written before I had read Bergson.

kind of cosmic or biologic legerdemain that baffles and bewilders us. It so far transcends all our earthly knowledge and experience and all the flights of our philosophy that we stand speechless before it. It opens a gulf that the imagination cannot clear; it opens vistas from which we instinctively shrink; it opens up abysms of time in which our whole historic period would be but a day; it opens up a world of struggle, delay, waste, failure that palls the imagination. It challenges our faith in the immanency and in the ceaseless activity of God in His world; it brings the creative energy down from its celestial abode and clothes it with the flesh and blood of animal life. It may chill and shock us; it shows us that we are of the earth, earthy; yea, that we are of the animal, beastly; it presses us down in matter; it puts out the lights to which we have so long turned as lighting our origin; the words "sacred," "divine," "holy," or "celestial," as applied to our origin and development, we have no longer any use for, or for any words or ideas that set us apart from the rest of creation above it in our origin or apart from it in our relations. The atmosphere of mystery and miracle and sanctity that our religious training has thrown around our introduction upon this planet and around our relations and destiny science dispels. Our language and many of our ideas and habits of thought date back to pre-scientific times—when there were two worlds, the heavenly and the earthly, separated by a gulf. Now we know that the two worlds are one, that they are inseparably blended, that the celestial and the terrestrial are under the same law, that we can never be any more in the heavens than we are here and now, nor any nearer the final sources of life and power, that the divine is underfoot as well as overhead, that we live on a star among the stars, that we are part and parcel of the physical universe and take our chances in the cosmic processes the same as the rest and draw upon the same fund of animal life that the other creatures do. We are identified with the worm underfoot no less than with the stars overhead. We are not degraded by such a thought, but the whole of creation is lifted up. Our minds and bodies are not less divine, but all things are more divine. We have to gird up our loins and try to summon strength to see this tremendous universe as it is, alive and divine to the last particle and embosomed in the Infinite.

Evolution is not the final explanation of the universe, but it is probably the largest generalization of the modern mind. Science has to start somewhere, and it starts with the universe as it finds it and seeks to trace secondary or proximate causes; the evolutionist seeks to trace the footsteps of creative energy in the world of animal life. How did God make man? Out of the dust of the earth, says the Bible of our fathers. The evolutionist teaches essentially the same thing, only he does not abridge the process as the catechism has abridged it for us; he would fain unfold the whole long road that man has traveled from the first protozoic cell to the vast communities of cells that now make up his physical life. He would show how man has risen on stepping-stones of his dead self. These stepping-stones have been the animal forms below him. In them and through them something, some impulse, some force, has mounted and mounted through all the enormous lapse of geologic time. In imagination we see the dim, shadowy man, restless and struggling in a vast number of earlier forms. He has struggled upward through the invertebrates, through the fish, through the reptile, through the lower mammals, through his simian ancestors till he reaches his goal in the man we know.

Darwin was not the author of the theory of evolution, but he made the theory alive and real to the imagination. He showed us what a master key it is for unlocking the riddle of the life of the globe. He launched biological science upon a new career and made it worthy of its place in the great trilogy of sciences, astronomy, geology, and biology, of which Tennyson, in his poem, "Parnassus," recognized only the first two. Had Tennyson written his poem in our day he would undoubtedly have included biology among his "terrible Muses" that tower above all others, eclipsing the glory of the great poets. Or is it true that we find it easier to accept the theory of the evolution of the worlds and suns from nebulous matter than to accept the theory of the evolution of man from the maze of the lower animal forms? It is less personal to us. The astronomer has the advantage of the biologist in one important respect: he can show us in the heavens now the process of the evolution of worlds actually going on, but the biologist cannot show us the transformation of one species into another taking place to-day. We can sound the abysses of astronomic space easier than we can sound the abysses of geologic time. The stars and the

nebulae we have always with us, but where are the myriad earlier forms that were the antecedents of the present animal life of the globe? True, the paleontologist finds a more or less disjointed record of them in the stratified rocks and sees in a measure the course evolution has taken, but he does not actually see it at work as does the astronomer. More than that, the forces the astronomer deals with are mechanical and chemical, but the biologist deals with a new force called life that often reverses or defies mechanical and chemical forces, but which is yet so identified and blended with them that we cannot conceive it apart from them. The stomach does not digest itself, nor gravity hold the blood in the lower extremities. The tree lifts up its weight of fluids and solids and holds aloft its fruit and foliage in spite of gravity; its growing roots split and lift the rocks; mosses and lichens disintegrate granite; vital energy triumphs over chemical and mechanical energy.

Biological laws are much more subtle and difficult to trace and formulate than chemical and mechanical laws. Hence the student of organic evolution can rarely arrive at the demonstrable certainties in this field that he can in the sphere of chemistry and mechanics. It is very doubtful if life can ever be explained in terms of these things. Life works through chemical combinations and affinities, and yet is it not more than chemistry? It works with and through mechanical principles and forces, and yet it is evidently more than mechanics. It is manifested through matter and yet no analysis of matter can reveal its secret. It comes and goes while matter stays; we destroy life, but cannot destroy matter. It is as fugitive as the wind which fills all sails one minute and is gone the next. It avails itself of fluids and gases and the laws which govern them, but fluids and gases do not explain it. It waits upon the rains and the dews, but it is more than they are; it follows in the footsteps of the decay and disintegration of the inorganic and yet it is not the gift of these things; it transforms the face of the earth and yet the earth has been and will be when it was and is not. Through his knowledge and his science man performs wonders every day; he can reduce mountains to powder and seas to dry land, but he cannot create or start *de novo* the least throb of life. At least, he has not yet done so. With all his vast resources of mechanics and chemistry, and his insight into the mechanism of the uni-



verse, he has not yet made the least particle of inorganic matter thrill with the mysterious something we call life.

There must have been a time when life was not upon the earth and there must again come a time when it will not be. It has probably vanished from the moon and all inferior planets and has not yet come to the superior planets, except maybe to Mars. It must be and always have been potential in matter, but this fact leaves the mystery as profound as ever.

Yet if the artificial production of life were to happen to-day—if in some of our laboratories living matter were produced from non-living, would we not still have to credit the event to some mysterious potency residing in matter itself? If by a lucky stroke man were to evoke the organic from the inorganic, be assured he would not evoke something from nothing, or add anything to the latent possibilities of the elements with which he works. Does not the question still remain, who or what made this feat possible? One dare affirm that man cannot create life *de novo* any more than he can create matter. He may yet evoke life as he evokes the spark from the flint and the flame from the match or as he evokes force from the food he eats. In this latter case he does not create the force; he liberates it through the vital forces of his body. The spark from the flint and the flame from the match were called forth by a mechanical process, but the process was set going by the will which waits upon the vital process. The body with all its many functions is a complicated system of mechanical devices and chemical processes, but that which is back of all and governs all is not mechanical; the body is a machine plus something else.

The chemist or biologist who shall produce a speck of protoplasm to-day will have the credit of unlocking a power in inorganic nature; he will prove by a short cut how immanent the creative energy or the vital force of the universe is in matter. He will not have eliminated the creative energy; he will only have disclosed it and availed himself of it.

We behold spontaneous combustion, a fire self-kindled, but we do not see the activity of the particles of matter that preceded it nor penetrate the secret of their mysterious affinities. The fire was potential there in the very constitution of the elements. We flout at miracles and then we disclose an unending miracle in the life about us.

All the life upon the globe, including man with all his

marvelous powers, surely originated upon the globe, surely arose out of the non-living and the non-thinking, not by the fiat of some power external to nature, but through the creative energy inherent in nature and ever active there. The great physical instrumentality was heat—without heat the reaction called life could never have taken place. This fact has led a French biologist to say that life is only a surface accident in the history of the thermic evolution of the globe. Without the disintegration of the rocks and the formation of the soil and the precipitation of watery vapor, which was indirectly the work of heat, the vegetable and the animal could not have developed. If we succeed in proving that all these things are of chemico-mechanical origin, we still want to know who or what instituted these chemical and mechanical powers and the laws that govern them. Creation by chemistry and mechanics is as mysterious as creation by miracle. We must still have a creator, while we can do nothing with Him nor find any place for Him in an endless, beginningless, infinite series of events. So there we are. We go out of the same door by which we came in.

When all life vanishes from the earth, as it will when the condition of heat and moisture has radically changed, and eternal refrigeration sets in—what then? The potencies of matter will not have changed and life will reappear and go through its cycle again on some other sphere.

Life began upon this earth not by miracle in the old sense, but by miracle in the new scientific sense—by the immanence and ceaseless activity of the creative energy in the physical world about us—in the sunbeam, in the rains, in the snows, in the air currents, and in the soil underfoot; in oxygen, hydrogen, carbon, nitrogen, in lime, iron, silice, phosphorus, and in all the rest of them. Each has its laws, its ways, its fixed mode of procedure, its affinities, its likes and dislikes, and life is bound up with all of them. If we hypothecate the ether to explain certain phenomena, why should we not hypothecate a vital force to account for other mysteries?

The inorganic passes into the organic as night passes into day. Where does one end and the other begin? No man can tell. There is no beginning and no ending of either and yet night comes and goes and day comes and goes—a constant becoming and a constant ending. We are probably in the midday of the life of the globe—life huge and rank and riotous—the youth of life has passed, life more sedate and

aspiring and spiritual has come. The gigantic has gone or is going, the huge monsters of the sea and of the land have had their day, man appears at the end of the series of lesser but more complete forms.

Many intelligent persons who have been rocked in the cradle of the old creeds still look upon evolution as a godless doctrine and accuse it of vulgarizing high and sacred things. This state of mind can only be slowly outgrown by familiarizing ourselves with the processes of nature or of the creative energy in the world of life and matter about us; with our own origin in the low fish-like or ape-like creature in the maternal womb; with the development of every plant, tree, and animal from a microscopic germ; with the unbroken sequence of natural law; with the waste, the delays, the pains, the failures on every hand; with the impersonal and the impartial character of all the physical forces; with the transformations and metamorphoses that mark the course of animal life; and, above all, with the thought that evolution is not self-caused or in any true sense a cause in itself, but the instrument or plan of the power that works in and through all things. The ways of God in all these details are past finding out, but science watches the unfolding of a bud, the development of a grain of wheat, the growth of the human embryo, the succession of life forms upon the globe, as revealed in the records of the stratified rocks, or observes in the heavens the condensation of nebulous matter into suns and systems, and it says this is one of His ways. Evolution—an endless unfolding and transformation. “Urge and urge and urge,” says Whitman (I love to repeat this saying; it is so significant), “always the procreant urge of the world.” Always the labor and travail-pains of the universe to bring forth higher forms; always struggle and pain and failure and death, but always a new birth and an upward reach.

Strike out the element of time and we see evolution as the great prestidigitator of the biologic ages. The creative energy manipulates a fish and it turns into a reptile; it covers a mollusk as with a vapor and behold! a backboned creature instead! Now we see a little creature no larger than a fox and when we look again, behold the horse; a wolf or some kindred animal is plunged into the water and behold the seal! Some small creature of the lemur kind is covered with a capacious hand and we look again and behold

Man! We have only to minimize time and minimize space to see the impossible happening all about us or to see the Mosaic account of creation repeated; we have only the clay and water to begin with, when, presto! what have we now? We behold the rocks covered with verdure, we see the mountains vanishing into plains, the valleys changing into hills, or the plains changing into mountains, tropic lands covered with ice and snow.

Lord Salisbury thought he had discredited natural selection, which is one of the feet upon which evolution goes, when he charged that no one had ever seen it at work. We have not seen it at work because our little span of life is too short. Only the paleontologist traces in the records of the rocks the footsteps of this god of change. And rarely if ever does he find a continuous and complete record—only a footprint here and there, but he sees the direction in which they are going and many of the places where the traveler tarried. The paleontologist, that detective of the rocks, works up his case with the same thoroughness and caution and the same power of observation that does the detective in human affairs and with a greater sweep of scientific imagination.

An agent of evolution is the influence of the environment, but who sees the environment set its stamp upon animal life? After many generations we may see the accumulated results. In a few instances the results are rapid. Thus sheep lose their wool in tropical climates and a northern furbearing animal its fur. The well-being of the animal demands this change, and demands it quickly. Fish lose their sense of sight in underground streams; this loss is not so vital and it comes about much more slowly. A tropical climate sets its stamp upon the complexion and character of man, but this again is a slow process, as the same stress of necessity does not exist.

In the tendency to variation—in form, size, disposition, power, fertility—man differs from all other animals. In the same race, in the same family, we find infinitely varied types. Among the wild creatures all the individuals of a species are practically alike. We can hardly tell one fox, or one marmot, or one chipmunk, or one crow, or one hawk, or one black duck from another of the same species. Of course there are slight individual differences, but they are hardly distinguishable. Among the insects one bee, one beetle, one

ant, one butterfly seems the exact copy of every other individual of its kind. The law of variation seems practically annulled in the insect world.

It is the wide and free range of this law in the human species that has undoubtedly led to the great progress of the race. There has been no dead level—no democracy of talent—no equality of gifts, but only equality of opportunity. Men differ from each other in their mental endowments, capacities, and dispositions vastly more than does any other creature upon the earth. This difference makes man's chances of progress so much the greater; he has so many more stakes in the game. If one type of talent fails another type may win; if the lymphatic temperament is not a success try the sanguine or the bilious; blue eyes and black eyes and brown eyes will win more triumphs than blue or black or brown alone. Arms or legs extra long, sight or hearing extra sharp, wit extra keen, judgment extra sure—all these things open doors to more progress. Variation gives natural selection a chance to take hold, and where the struggle for life is the most severe the changes will be the most rapid and the most radical. Without the pressure of the environment natural selection would not select. The tendency to physical variation in man is probably no greater than in other creatures, but his tendency to mental variation is enormous. He varies daily from mediocrity to genius, hence the enormous range of his chances of progress. From the first variation that started him on his way in his line of descent, variation must have been more and more active till he varied in the direction of reason, long before the dawn of history, since which time his progress has been by rapid strides—and more and more rapid till we see his leaps forward in recent times. The race owes its rapid progress to its exceptional men, its men of genius and power, and these have often been like sports or the sudden result of mutations—a man like Lincoln springing from the humblest parentage. No such extreme variations are seen in any of the lower orders. Indeed, in one's lifetime one sees but very slight variation in any of the wild or domestic creatures, less in the wild than in the domestic because less under the influence of that most variable of animals, man. And man's variations are mainly mental and not physical. The higher we go in the scale of powers the greater the variation and hence the more rapid the evolution. Probably man's body has not

changed radically in vast cycles of time, but his mind has developed enormously since the dawn of history.

Biologists are coming more and more to recognize some unknown factor in evolution, probably some unknowable factor. The four factors of Osborn—heredity, ontogeny, environment, selection—play upon and modify endlessly the new form when it is started, but what about the original start? Whence comes this inborn momentum, this evolutionary send-off? What or who set the whole grand process going?

Bergson sees an internal psychological principle of development, hence the name of his book *Creative Evolution*. Osborn uses the word “directed.” Certain characters, he says, are adaptive or suited to their purpose from the start; they do not have to be fitted to their place by natural selection. Huxley uses the word “predestined”—all the life of the globe and all the starry hosts of heaven are working out in boundless space and in endless time “their predestined course of evolution.” Darwin must have had in mind the same mysterious something when he said that man had risen to the very summit of the animal scale, but not through his own exertions. Not by his own will or exertion, surely, any more than the embryo in its mother’s womb develops into the full-grown child by its own exertion, or than our temperaments and complexions and statures are matters of our own wills and choice. Something greater than man and before him, to which he sustains the relation that the unborn child sustains to its mother, must enter into our thought of his origin and development.

The great evolutionists have been very cautious about seeking to go behind evolution and name the Primal Cause. In such an attempt science would at once be beyond soundings. Darwin and Huxley were reverent, truth-loving men, but they hesitated as men of science to put themselves in a position where no step could be taken.

Slowly man emerges out of the abyss of geologic time into the dawn of history and science gropes about like a man feeling his way in the dark or at most, by the aid now and then of a dim flash of light, to trace the path he has come. He has surely arrived, and we are, I believe, safe in saying he has come by the way of the lower orders; but the precise forms through which he has come, the houses in which he has tarried by the way, and all the adventures and vicissitudes

that befell him on the journey—can we ever hope to know these things? In any case, man has his antecedents; life has its antecedents; every beat of one's heart has its antecedent cause, which again has its antecedent. We can thus traverse the chain of causation only to find it is an endless chain; the separate links we can examine, but the first link or the last we see by the very nature of things, and the laws of our own minds must forever elude us. Science cannot admit of a break in the chain of causation, cannot admit that miracles or the supernatural, in the old sense, as external and arbitrary interference with the natural order, can play or ever has played any part in this universe. Yet science has to postulate a First Cause when it knows, or metaphysics knows for it, that with the Infinite there can be no first and no last, no beginning and no ending, only endless succession.

To science man is not a fallen creature, but a many times risen creature and all the good of the universe centers in him. The mind that pervades all nature and is active in plant and animal alike first comes to know itself and regard itself and achieve intellectual appreciation in man. While all nature below man is wise only to its own ends and goes its appointed way as void of self-consciousness as the stone that falls or the wind that blows, the mind of man attains to disinterested wisdom and turns upon itself and upon the universe the power of objective thought; it alone achieves understanding.

In our studies of life and of the universe as soon as we begin to bridge chasms by an appeal to the miraculous, or to the extra-natural powers, we are traitors to the scientific spirit which we seek to serve. There are many things that science cannot explain. Perhaps I may say that it cannot give the ultimate explanation of anything. It can do little more than tell us of the action, the interaction, and the reaction of things, but of the things themselves, their origin and ultimate nature, or the source of the laws that govern them, what does it or what can it know?

Man is the heir of all the geologic ages; he inherits the earth after countless generations of animals and plants, and the beneficent forces of wind and rain, air and sky, have in the course of millions of years prepared it for him. His body has been built for him through the lives and struggles of the countless beings who are in the line of his long descent;

his mind is equally an accumulated inheritance of the mental growth of the myriads of thinking men and unthinking animals that went before him. In the forms of his humbler forbears he has himself lived and died myriads of times to make ready the soil that nurses and sustains him to-day. He is a debtor to Cambrian and Silurian times, to the dragons and saurians and mastodons that have roamed over the earth. Indeed, what is there or has there been in the universe that he is not indebted to? The remotest star that shines has sent a ray that has entered into his life. All things are under his feet, and the keys of the heavens are in his hands.

One would fain arrive at some concrete belief or image of his line of descent in geologic time as he does in the historic period. But how hard it is to do so! Can we form any mental picture of the actual animal forms that the manward impulse has traveled through? With all the light that paleontology throws upon the animal life of the past, can we see where amid the revel of these bizarre forms our ancestor hid himself? Can we see him as a reptile in the slime of the jungle or in the waters of the Mesozoic world? What was he like or what akin to? What mark or sign was there upon him at that time of the future that was before him? Can we see him as a fish in the old Devonian seas or lakes? Was he a big fish or a little fish? The primitive fishes were mostly of the shark kind. Is there any connection between that fact and the human sharks of to-day? Much less can one picture to one's self what his ancestor was like in the age of the invertebrates amid the trilobites, for example, of the earlier Paleozoic seas. But we must go back even earlier than that, back to unicellular life and to original protoplasm, and finally back to fiery nebulous matter. What can we make of it all by way of concrete conception of what actually took place—of the visible, eating, warring, breeding animal forms in whose safekeeping our heritage lay? Nothing. We are not merely at sea, we are in abysmal depths, and the darkness is so thick we can cut it.

We meet the same difficulty when we try to figure to ourselves the line of descent of any of the animal forms of to-day. How did they escape the world-wide catastrophe of earlier geologic times? Or did the creative impulse bank upon life as a whole and never become bankrupt, no matter what special lines or forms failed?



The first appearance of the primates is in Eocene times, and the anthropoid apes in the Miocene, probably five millions of years ago. The form which may have been in our line of descent, the *Dryopithecus*, later appears to have become extinct. Did our fate hang upon the success of any of these forms? The monkeys and anthropoid apes appeared at the same time in different countries. Nature seems to have been making preliminary studies of man in these various forms, but when and where she hit upon the form that she perfected in man, who knows?

The horse appears to have been evolved in North America, true cattle in Asia, elephants in Africa. Can we narrow their line of descent down to a single pair for each? Many forms allied to the horse appeared in Europe and Asia in Miocene times. We find monkeys in different parts of the world in the same geologic horizons—did they all have a common origin?

Life's apprenticeship has been a long one. The earlier forms of vertebrate life were very large; later they became very small. Nature seems to have experimented with bulk as if she thought size would win in the race. Hence those huge uncouth forms among the reptiles and early mammals. The scheme did not work well; bulk was not the thing, after all. Most of the gigantic forms became extinct. Then she tried smaller and more agile forms with larger brains—less flesh and more wit. On this line Nature continued to work till she produced her masterpiece in man—a rather feeble and nearly weaponless animal, but with an intangible armory of weapons and tools in his brain that enables him to put all creatures under his feet.

JOHN BURROUGHS.